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Rulemaking to Amend Parts 1, 2, 21 and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate to the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services

CC Docket No. 92-297

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PETITION FOR PARTIAL RECONSIDERATION

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COMMUNICATIONS, INC.**

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Dated: September 27, 1996

SUMMARY

Motorola Satellite Communications, Inc. ("Motorola") petitions for partial reconsideration of the Commission's First Report and Order in this proceeding.

Motorola's petition is limited to that portion of the Commission's Report and Order that establishes a new Section 25.258(c) of its Rules requiring NGSO MSS systems that wish to use the 29.25-29.50 GHz band to compensate for nodal regression.

This rule would impose unnecessary technical constraints on Big LEO MSS operations without guaranteeing that sharing with GSO FSS systems in the band would be accomplished. The rule could soon become a worldwide standard, reducing NGSO MSS systems to de facto secondary status in the band although the ITU and Commission recently granted NGSO MSS co-primary status in recognition of the shortage of essential feeder link spectrum. At the same time, the Commission should clarify that language in its Report and Order that could be construed as prohibiting Motorola from operating in the 29.25-29.5 GHz band is not intended to so, but only requires Motorola to coordinate with GSO FSS licensees authorized to operate in the band.

The Commission's 28 GHz band plan is otherwise a masterstroke in compromise. Generally, Motorola believes that it strikes the correct balance of spectrum needs for the MSS, FSS and LMDS industries. Motorola does not object to the band plan to the extent that it requires the IRIDIUM® System to share the 29.1-29.25 GHz band with other NGSO MSS systems and the LMDS community, subject to the established sharing rules. Motorola only opposes the Commission's

creation of a new rule that requires NGSO MSS satellites operating in the 29.25-29.5 GHz band to maintain constant successive sub-satellite ground tracks on the surface of the Earth.

FIRST, the Commission should not adopt, as a general technical rule, a standard that meets the sharing requirements of only one NGSO MSS system: TRW's Odyssey system. The parties proposing the rule -- TRW and Hughes -- admit that the rule cannot be used by other NGSO MSS systems to coordinate with GSO FSS systems.

SECOND, Motorola's initial analysis of the nodal regression requirement indicates that this standard will not necessarily facilitate sharing. Moreover, the rule would unnecessarily force NGSO constellations to operate their systems at one of a few specific altitudes and inclinations.

THIRD, the Commission's rules should not adopt one company's satellite configuration as a de facto standard for operations in a band that the Commission has allocated for feeder link operations for the NGSO MSS industry. This is particularly true where there is no evidence to date that limits on nodal regression will actually facilitate sharing between NGSO MSS and GSO FSS systems. Motorola's concern is heightened by the possibility that other nations may also adopt this rule under the mistaken assumption that the Commission believes that sharing can be accommodated in this band for all Big LEO MSS operators when in fact this technique, if it works at all, will only do so for TRW and Hughes. In fact, Task Group 4/5 of the ITU and the

Conference Preparatory Meeting to WRC-95 have already rejected this method as a means of facilitating sharing in the feeder link bands.

FOURTH, the Commission should clarify that, consistent with the co-primary status of NGSO MSS operations in the 29.25-29.5 GHz band, Motorola and other NGSO MSS systems are authorized to use the band subject to coordination with licensed GSO FSS systems for feeder link operations on a global basis. Such coordination should be based on a first-come-first-served coordination policy.

FINALLY, the Commission should condition TRW's use of this band upon its completing a successful coordination with GSO FSS systems based upon its unique ability to avoid nodal regression. Imposing these technical conditions upon TRW, rather than adopting a general technical rule, is consistent with the Commission's efforts to foster sharing elsewhere in the Ka-band. Other NGSO MSS systems should be free to fashion other specific coordination arrangements with GSO FSS systems that meet the Commission's goal of sharing this band.

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**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of

**Rulemaking to Amend Parts 1, 2, 21
and 25 of the Commission's Rules
to Redesignate the 27.5-29.5 GHz
Frequency Band, to Reallocate to
the 29.5-30.0 GHz Frequency Band,
to Establish Rules and Policies for
Local Multipoint Distribution Service
and for Fixed Satellite Services**

CC Docket No. 92-297

To: The Commission

PETITION FOR PARTIAL RECONSIDERATION

Motorola Satellite Communications, Inc. ("Motorola") respectfully submits this Petition for Reconsideration in response to the Commission's First Report and Order in the above-captioned proceeding.^{1/} Motorola is an interested party in this rulemaking proceeding as the licensee of the IRIDIUM® System, which uses the 1.6 GHz band to provide Mobile Satellite Service ("MSS") as well as the 19/28 GHz bands for its feeder links and system control operations.^{2/} An affiliate of Motorola, Comm, Inc., is also an applicant for a GSO FSS system in these bands.

^{1/} First Report and Order and Fourth Notice of Proposed Rulemaking, FCC 96-311 (rel. July 22, 1996), 61 F.R. 44177 (August 28, 1996) ("First Report").

^{2/} Motorola Satellite Communications, Inc., 10 FCC Rcd 2268 (Int'l Bureau 1995); reconsideration denied, Memorandum Opinion and Order, FCC 96-279 (rel. June 27, 1996).

Motorola generally supports the 28 GHz band plan adopted by the Commission. It recognizes the difficult balance that the Commission has attempted to strike in order to accommodate the spectrum needs of the MSS, FSS and LMDS industries. The Commission's 28 GHz band plan is a masterstroke in compromise in an unprecedented spectrum allocation proceeding. Motorola applauds the Commission's efforts to find creative solutions in what has been an exceedingly complex and contentious set of issues.

Motorola's concern with the band plan is limited to the conditions placed on use of the co-primary allocation of spectrum for the IRIDIUM System's essential feeder link operations at 29.25-29.5 GHz. The First Report concluded that Non-Geostationary Satellite Orbit ("NGSO") MSS feeder link earth stations, such as Motorola's, and LMDS operations would share 150 MHz of spectrum at 29.1-29.25 GHz subject to significant constraints on both types of service. The Commission also concluded that Motorola must share the 29.1-29.25 GHz band with TRW's Odyssey™ feeder link operations. This decision also places significant limitations on Motorola's use of this feeder link spectrum. Motorola does not herein seek reconsideration of these limits on its operations.

The Commission concluded, however, that Motorola would not be allowed to use the 29.25-29.5 GHz band for its feeder link operations in accordance with the sharing rules.^{3/} The Commission's new rule -- Section 25.258(c) -- requires NGSO MSS satellites operating in the band to compensate for nodal regression and maintain

^{3/} First Report at ¶ 63.

constant successive sub-satellite ground tracks on the surface of the Earth. Motorola requests reconsideration of the adoption of this new rule. Motorola also requests that the Commission clarify that Motorola is permitted to use this band for feeder link uplinks subject to coordination with GSO FSS licensees.

Motorola's initial review of this new rule indicates that it creates a technical standard that is unworkable for NGSO MSS space stations.⁴ TRW itself admits that this approach cannot realistically be used by any other NGSO MSS system other than Odyssey. Rather than retaining this untested requirement, the Commission should delete Section 25.258(c) from its Rules and simply impose it as a condition for TRW's use of this portion of the band. Consistent with the Commission's conclusion that NGSO MSS/ GSO FSS users will have co-primary status in the band, the Commission should maintain its first-come-first-served coordination policy.

⁴ Motorola did not previously comment on the negative impact that this rule would have on MSS operation in the band because the Commission's Notice of Proposed Rulemaking did not discuss either the terms or substance of a "nodal regression" requirement as required by Section 553(b) of the Administrative Procedures Act, 5 U.S.C. §553(b)(3). Rather, Motorola assumes that the genesis of this requirement came from ex parte communications by TRW and Hughes. Moreover, the written ex parte documents in the record from these parties do not propose or suggest that a rule be adopted or that the Commission should consider requiring repeating ground tracks in the band. See MCI v. F.C.C., 57 F.3d 1136, 1140-1142 (D.C. Cir. 1995) (footnotes in a notice and comments from other parties do not constitute adequate public notice of a proposed rule); Small Ref. Lead Phase-Down Task Force v. U.S. EPA, 705 F.2d 506, 549-550 (D.C. Cir. 1983) (agency must provide notice itself; it cannot bootstrap notice from comments).

I. THE COMMISSION SHOULD NOT ADOPT A GENERAL RULE THAT MEETS THE SHARING NEEDS OF ONLY TWO PRIVATE PARTIES

The Commission has no record evidence that a "nodal regression" rule will facilitate sharing between all NGSO MSS and GSO FSS systems. Rather than adopting a general rule that will not resolve sharing concerns in this band for all NGSO MSS systems, as TRW and Hughes readily admit, the Commission should limit the applicability of this standard to the specific sharing arrangement proposed by TRW and Hughes.

A. TRW And Hughes Admit That The Nodal Regression Requirement Meets Only Their Sharing Needs

The Commission should not impose a rule with broad applicability when the parties proposing the rule admit that it cannot be used by other NGSO MSS systems to coordinate with GSO FSS systems. In an ex parte filing with the Commission, Hughes emphasized that its sharing arrangement with TRW was based on "three fundamental assumptions" that must be met.^{5/} One of those assumptions is that GSO FSS will share only with TRW.

This is a solution that applies only to one specific NGSO MSS system: Odyssey. The characteristics of the Odyssey system that make this solution possible include the relatively few spacecraft (12) in the Odyssey system, and the fact that TRW uses predicable, repeating ground tracks.^{6/}

^{5/} February 6, 1996 Letter from John Janka to Thomas Tycz placed in the record of CC Docket No. 92-297 ("Hughes Letter").

^{6/} Hughes Letter at 3-4.

Hughes goes on to indicate that its arrangement could form a basis for future coordination discussions, "but it is simply not possible at this time to address whether that solution will work with another, yet undefined, NGSO MSS system"⁷¹ Finally, Hughes stresses that this sharing arrangement is "not applicable to Iridium..." since "the Iridium architecture does not include the elements described above that make this method of sharing applicable."⁷² TRW's ex parte presentation to the Commission also stresses the limited applicability of this sharing arrangement. "This sharing arrangement is only applicable to GSO/FSS operators and one type of NGSO/MSS system (namely, Odyssey™). An additional NGSO/MSS system will be accommodated only subject to further sharing and coordination agreements (sic) that are acceptable to the affected parties."⁷³

These conclusions by Hughes and TRW do not justify the adoption of a general rule that is only applicable to one NGSO MSS system: Odyssey. With this rule, any other NGSO MSS system would be foreclosed from using these bands in their entirety. In its First Report, the Commission expressly allocated the 29.1-29.5 GHz band to NGSO MSS feeder link operations.¹⁰⁴ The Commission should not then adopt a technical rule that makes this essential spectrum unusable for all but one NGSO MSS

⁷¹ Id. at 4.

⁷² Id. (emphasis in original).

⁷³ "Co-directional Frequency Sharing Between Odyssey Feeder links and GSO/FSS Service Links in 29.25-29.5 GHz and 19.45-19.7 GHz Bands," Presentation of M. Horstein and R. Rusch, February 5, 1996, at 7.

¹⁰⁴ First Report at ¶ 57.

System. It should instead leave other MSS systems free to fashion different technical solutions for coordinating with GSO FSS systems in this band.

Motorola's initial analysis of the nodal regression requirement indicates that this approach may not necessarily facilitate sharing. As the analysis at Appendix 1 indicates, the Commission's rule does not identify the measurable outcome that other NGSO MSS licensees must replicate. Instead, the rule requires a specific method of operation that may or may not meet the unstated goal. The rule's assumption that compensating for nodal regression will produce repeating ground tracks is incorrect. The rule does not indicate whether other methods of compensating for nodal regression would meet the intent of the rule. It provides no guidance as to how many ground tracks an MSS system can employ before the purpose of the rule is defeated. The rule does not account for the fact that, if multiple NGSO MSS systems are deployed using more than one of the altitudes that would result in repeating ground tracks, the resulting number and location of these ground tracks would defeat the purpose of the rule and contribute to guaranteed high levels of interference with GSO FSS earth stations. In short, the rule would force NGSO MSS constellations to operate their systems at one of a few specific altitudes with specific inclinations, forcing the system to shift coverage areas to meet coordination requirements rather than matching intended service areas -- without establishing a viable sharing regime.

The Commission should also not adopt as a general rule a technical standard that will have the effect of inhibiting Big LEO system's technical innovation. The narrowness of the "nodal regression" rule is highlighted by the fact that it forms

part of a recently-granted TRW patent.^{11/} Rather than mandating a requirement that can only be met by TRW, the Commission should require good faith coordination as it does for other satellite operations.

B. The Nodal Regression Rule Is Inconsistent With International Efforts To Identify Bands For Use In NGSO MSS Feeder Link Operations

At WRC-95, the international community recognized that there is insufficient spectrum available for NGSO MSS feeder link operations. The Conference concluded that more spectrum must be made available for this service to meet the global demand for NGSO MSS services.^{12/} The Commission's new rule would have the effect of severely limiting, if not foreclosing, the use of portions of these bands by the emerging NGSO MSS services.

In fact, the international community has already rejected a requirement for the use of repeating ground tracks as an interference mitigation technique. ITU Task Group 4/5 concluded that repeating ground tracks actually result in more serious interference opportunities than if they were not used at all.^{13/} The WRC-95 Conference Preparatory Meeting concluded that when the number of NGSO satellites is large, any advantages that are achieved by repeating ground tracks are negated. Moreover,

^{11/} See, TRW Patent No. 5,551,624 granted September 3, 1996. Motorola understands that TRW has since withdrawn this patent, but TRW may still have a similar patent application pending.

^{12/} See, e.g. Resolution 120: "Use of the Bands 19.3-19.7 GHz and 29.1-29.5 GHz By Feeder Links For Non-GSO MSS Networks."

^{13/} Report of The Final Meeting of Task Group 4/5 of Radiocommunication Study Group 4 (Geneva, 22-30 November 1994).

interference to earth stations not positioned outside the ground tracks is several times greater than if there were no repeating ground tracks at all.¹⁴ Therefore, the sharing scheme urged upon the Commission as a general rule by TRW and Hughes will not resolve the global sharing requirements of NGSO MSS and GSO FSS operators. It will only serve to keep MSS operators, other than TRW, from using this essential band. Without the agreement of the international community that this rule is an appropriate means of avoiding interference, the Commission's "nodal regression" requirement will serve no legitimate purpose.

The Commission's rules should not result in the adoption of one company's satellite configuration as the de facto world standard for operating in this band when it was allocated for use by multiple NGSO MSS systems. Such a rule is inconsistent with ITU efforts to find sufficient spectrum for NGSO MSS feeder link operations. Moreover, other nations may adopt this rule under the mistaken assumption that the Commission believes that sharing can be accommodated in this band for all Big LEO MSS operators when in fact this technique, if it works at all, will only do so for TRW and Hughes.

C. The Commission Should Clarify Its Decision So That Motorola May Use The Subject Band Based Upon A First-Come-First-Served Coordination Policy

The First Report creates the mistaken impression that the IRIDIUM System and other NGSO MSS systems may not use the 29.25-29.50 GHz band for

¹⁴ ITU-R/CPM-95, Conference Preparatory Meeting, Report to WRC-95 ¶ 3.1.7. Chapter 2, Section I, Part C.

feeder link operations. However, consistent with the co-primary status of NGSO MSS operations in this band, the IRIDIUM System and other NGSO MSS systems should have access to the band subject to a first-come-first-served coordination policy.

In its First Report, the Commission states that "Motorola will be limited to operating its feeder links within this 150 MHz band [29.1-29.25 GHz], since Motorola indicates it will be unable to share with GSO/FSS systems in the adjoining [29.25-29.50 GHz] band."^{15/} This statement creates the mistaken impression that Motorola is forbidden forever from using this portion of the band under all circumstances. The Commission should clarify that Motorola and other NGSO MSS systems are authorized to use this spectrum subject to coordination with GSO FSS systems in all parts of the world as necessary. While the Commission's statement may be true today in the U.S. due to the current technical limitations on sharing with GSO FSS systems and its resulting domestic band plan, it is not true in the rest of the world. The Commission should therefore remove or clarify this language.^{16/}

Consistent with the Commission's conclusion that the 29.25-29.50 GHz band will be shared on a co-primary basis between NGSO MSS and GSO FSS, this coordination should be based on a first-come-first-served policy for resolving intractable coordination problems in the band. The Commission's decision to eliminate

^{15/} First Report at ¶63.

^{16/} For example, the Commission, acting on behalf of the U.S. Administration, signed a coordination agreement with the Japanese Administration in which the IRIDIUM System is authorized to use the 29.25-29.30 GHz band to implement the coordination plan agreed to with the N-Star and COMETs systems. If the Commission retains its nodal regression rule, it must reconsider the rule's impact outside of the U.S. in similar required coordinations.

this policy for the band has the effect of giving GSO FSS de facto primary status in the band. Motorola does not believe this to be the Commission's intent, particularly in light of other language in the First Report. Elsewhere, the Commission states that other NGSO MSS systems may use the band for feeder link uplinks "subject to coordination agreements with existing GSO/FSS parties."^{17/}

II. THE COMMISSION SHOULD DELETE SECTION 25.258(C) AND ONLY IMPOSE NODAL REGRESSION AS A CONDITION OF TRW'S USE OF THE BAND

The Commission should not adopt Section 25.258(c) of its Rules as a condition for NGSO MSS operations in the 29.25-29.50 GHz band. As the discussion above and Appendix A indicate, this rule would effectively limit use of the band to TRW's Odyssey system and inhibit Big LEO technology development in these frequencies. Rather than adopting a general rule, the Commission should condition TRW's use of this band upon its completing a successful coordination with GSO FSS systems using its "unique" ability to compensate for nodal regression.

Imposing these technical requirements upon TRW, rather than adopting a general rule, is consistent with the Commission's efforts to foster sharing elsewhere in the Ka-band. In the 29.1-29.25 GHz band, the Commission established general principles -- not specific technical rules -- for sharing between TRW, Motorola and perhaps other NGSO MSS feeder link operations.^{18/} The only specific rule adopted to

^{17/} First Report at ¶74.

^{18/} First Report at ¶63-66.

facilitate sharing between the parties was the general obligation to coordinate earth stations located 800 km or less apart.^{19/}

The Commission should adopt a similar policy for NGSO MSS/GSO FSS sharing of the 29.25-29.50 GHz band. TRW's use of this band should be conditioned on its compensation for nodal regression as described in its ex parte presentations. However, other MSS systems' use of the band should not be conditioned upon maintaining constant successive sub-satellite ground tracks. As Motorola explains in its Technical Appendix, this is just one possible means of avoiding interference with FSS earth stations and should not be adopted as a general requirement for NGSO MSS systems using the band.

Deleting new rule 25.258(c) will not threaten sharing between TRW and GSO FSS systems in any way. TRW, Hughes and others may still be able to share this spectrum using this technique. Moreover, deleting Rule 25.258(c) will afford other MSS systems seeking to use the band flexibility to coordinate in the band consistent with current Commission coordination requirements.

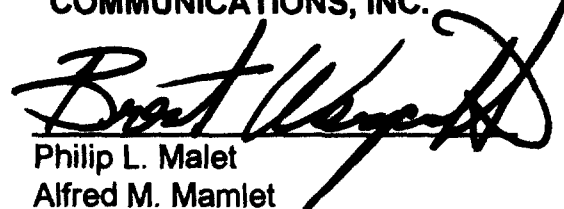
^{19/} See new Section 25.250(b).

III. CONCLUSION

The Commission should not adopt a specific technical requirement for compensating for nodal regression as a condition of using the 29.25-29.50 GHz band. The requirement will work, if at all, only for TRW's sharing of the band with GSO FSS systems. Therefore, the Commission should delete the specific rule and simply condition TRW's use of the band on the technical requirement it claims will permit it to share the band. Other NGSO MSS systems should not be required to mimic TRW's system attributes as a condition for using this band. These NGSO MSS systems should only be required to coordinate with existing FSS licensees in good faith as the current rules require.

Respectfully submitted,

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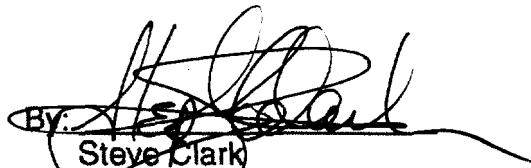
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Dated: September 27, 1996

**CERTIFICATION OF PERSON RESPONSIBLE
FOR PREPARING ENGINEERING INFORMATION**

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in this Petition for Reconsideration, that I am familiar with Part 25 of the Commission's Rules, that I have either prepared or reviewed the engineering information submitted in this Petition, and that it is complete and accurate to the best of my knowledge and belief.

By: 

Steve Clark
Systems Engineer
Motorola Satellite Communications Group

September 27, 1996

Appendix 1

Technical Evaluation of New FCC Rule 25.258 (c)

Rule 25.258(c) states that in order for an NGSO MSS system to use the 29.25-29.50 GHz band, it must compensate for nodal regression caused by the oblate shape of the Earth. The rule goes on to suggest that by doing so, "constant successive sub-satellite ground tracks on the surface of the Earth" will result. The phrase "constant sub-satellite ground tracks" has been interpreted in this analysis to mean "repeating ground tracks", since the Rule's terminology is not widely used within the astrodynamics community. The following analysis concludes that this Rule is technically flawed. Compensating for nodal regression does not guarantee that a "repeating ground track" will result.

There is more than one method available to compensate for nodal regression. First, a satellite could perform a maneuver at the maximum or minimum latitude points along its orbit and thereby adjust the ascending node crossing location on the Equator. This action would therefore compensate for nodal regression but would not result in "repeating ground tracks". This method would consume great amounts of fuel over the lifetime of the satellite and is therefore an unlikely interference avoidance method.

A second method would use the knowledge of nodal regression rates and the satellite's orbit period to synchronize the movement of the satellite with the natural rotation of the Earth. This is possibly what the authors of the Rule originally intended. This unstated objective would permit the constellation designer to position repeating ground tracks of an NGSO MSS system where they will result in favorable geometry for existing GSO FSS earth stations, producing minimal interference opportunities. In order for this to be accomplished, however, the location of all GSO FSS earth stations requiring the protection of this Rule must be known prior to the first launch of each NGSO MSS system. GSO earth stations constructed after the first launch of any NGSO MSS system would be protected from NGSO MSS uplinks only if they are located in favorable positions with respect to the agreed upon existing NGSO MSS ground tracks.

The second portion of the Rule that forces all NGSO MSS systems to have "repeating ground tracks" does not attempt to define how many ground tracks are sufficient and over what time period they must repeat. A technical analysis of the requirements needed to produce "repeating ground tracks" is set out below. This technical analysis demonstrates how limiting this requirement is on any new system. The requirement would be impossible for an existing or planned system (i.e., under development) to implement.

Traditionally, "repeating ground tracks" have been interpreted within the industry as an integer number of orbit revolutions per sidereal day (one earth rotation cycle). Repeat cycles longer than one day could be considered but are ineffective in achieving the objective of defining a minimum number of NGSO MSS

ground tracks that provide the maximum flexibility for coordinating all GSO earth stations. The controlling equation for "repeating ground tracks" is:

$$n\text{Revs} * P * (W_{\text{Earth}} - \text{NodeRate}) = 360^{\circ} \quad (\text{Equation \#1})$$

where:

- P = Orbit period
- nRevs = Orbit repeat factor (integer)
- W_{Earth} = Rotation rate of the Earth
- NodeRate = Regression rate of the orbit's ascending node

The constellations' orbit must be selected such that the altitude and inclination produces an orbit period and regression rate that satisfies Equation 1. The following table shows the possible orbits where Equation 1 could be satisfied.

Table A. Orbits Which Produce Repeat Ground Tracks

Revs Per Sidereal Day	Altitude (Km)	Orbit Period (seconds)	Node Rate (Deg/S. Day)	Selected Inclination
1	35,786.40	86,164.09	N/A	0°
2	20,181.68	43,076.88	-0.0433	50°
3	13,888.33	28,712.46	-0.1117	50°
4	10,348.25	21,527.95	-0.2187	50°
5	8,032.32	17,215.20	-0.3685	50°
6	6,378.49	14,338.21	-0.5646	50°
7	5,127.50	12,281.52	-0.8103	50°
8	4,141.80	10,737.45	-1.1087	50°
9	3,341.08	9,535.05	-1.4628	50°
10	2,675.02	8,571.77	-1.8755	50°
11	2,110.33	7,782.32	-2.3498	50°
12	1,624.08	7,123.19	-2.8888	50°
13	1,199.88	6,564.27	-3.4957	50°
14	825.70	6,084.05	-4.1737	50°
15	492.47	5,666.74	-4.9265	50°

Note. A different value of inclination will change these numbers slightly.

From Table A it is clear that there are only a few altitudes possible that meet the requirements of Equation 1. When real world effects such as high radiation environments (the Van Allen belts) are taken into account, the rows with 5 revs per day through 12 revs per day become unusable with today's satellite technology. This leaves only the 13-15 rev constellations available to operators for LEO space systems. In order for the letter of 25.258(c) to be met, the Commission would be severely restricting the technical flexibility of NGSO MSS operators to only three potential altitudes.

There are also several interpretations of the Rule which could be made concerning how to count repeating ground tracks. For example, do all satellites follow the same "paint stripe" around the Earth or can each satellite define its own

"paint stripe" independent of the other satellites in the same constellation? Figure 1 shows a 4 revs per day constellation (12 satellites with each satellite in its own plane) containing the fewest number of "paint stripes" possible. This constellation is valid at the Medium Earth Orbit (MEO) altitude used by several MSS systems as is shown in Table A. The pattern shown in Figure 1 could be shifted either left or right (in longitude) as needed for coordination. Figure 2 shows a variation of this same constellation where each satellite is allowed to have its own "paint stripe" rather than having to follow the satellite ahead of it. The constellation once again has 12 satellites but is comprised of 4 planes with 3 satellites in each plane.

None of the NGSO MSS constellations on file in the U.S. contain four planes. One system, has three planes with 4 satellites in each plane. Using this constellation, the resulting repeating ground tracks are shown in Figure 3. Notice how many ground tracks result during one sidereal day. The variation in the number of ground tracks can easily be seen from the minimum in Figure 1 to a maximum in Figure 3. Each of these constellations incorporates only 12 satellites. Each can claim to have repeating ground tracks which compensate for the regression of the nodes. However, the results are vastly different and would lead to varying degrees of flexibility during the coordination process, the greatest flexibility being available with the system shown in Figure 1 and the least in Figure 3. As the number of satellites in a constellation increases, the number of possible "paint stripes" also increases dramatically. A constellation of 60 satellites choosing to operate at 825 Km altitude could produce 840 separate ground tracks in a single sidereal day. This large number of ground tracks would accomplish little in the way of providing flexible options for coordination.

The ITU, through Working Party 4A, has studied the merits of using repeating ground tracks. Its report concluded that requiring NGSO MSS systems to use repeating ground tracks was "undesirable from the point of view of resulting interference statistics into GSO FSS networks."¹

The reason for adopting any technical rule should be to achieve a specific, measurable objective. When a specific method for achieving an objective is included in the text of a rule, the method should be identified as "one possible method" and not the only method. When a method is proposed, it must guarantee that the objective of the rule is always met. The analysis presented above indicates that Rule 25.258(c), as written, does not accomplish these objectives. Furthermore, the Rule severely restricts NGSO MSS constellation designers to altitude regimes at or near the altitudes listed in Table A.

¹ Report Of The Final Meeting Of Task Group 4/5 Of Radiocommunication Study Group 4 (Geneva, 22-30 November 1994)

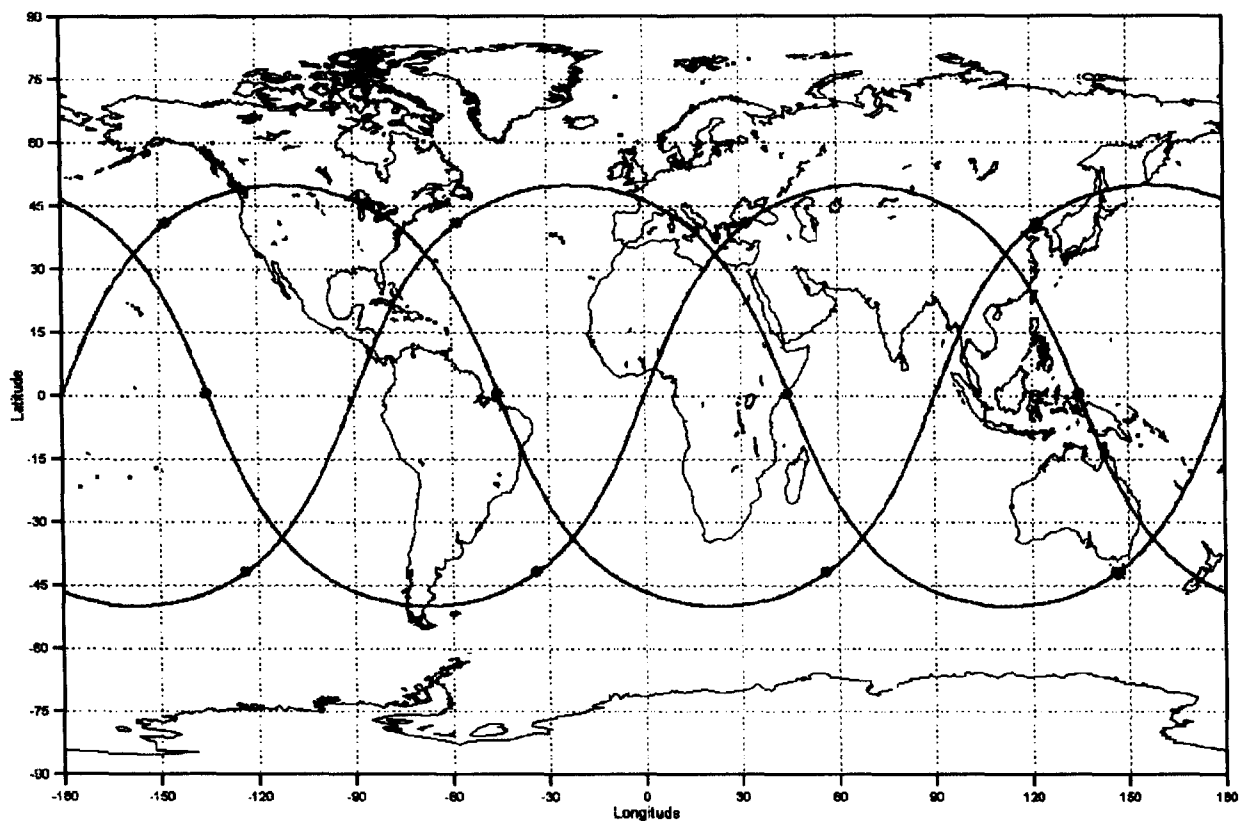


Figure 1. 12 Satellite Constellation Producing The Minimum Number Of Repeating Ground Tracks

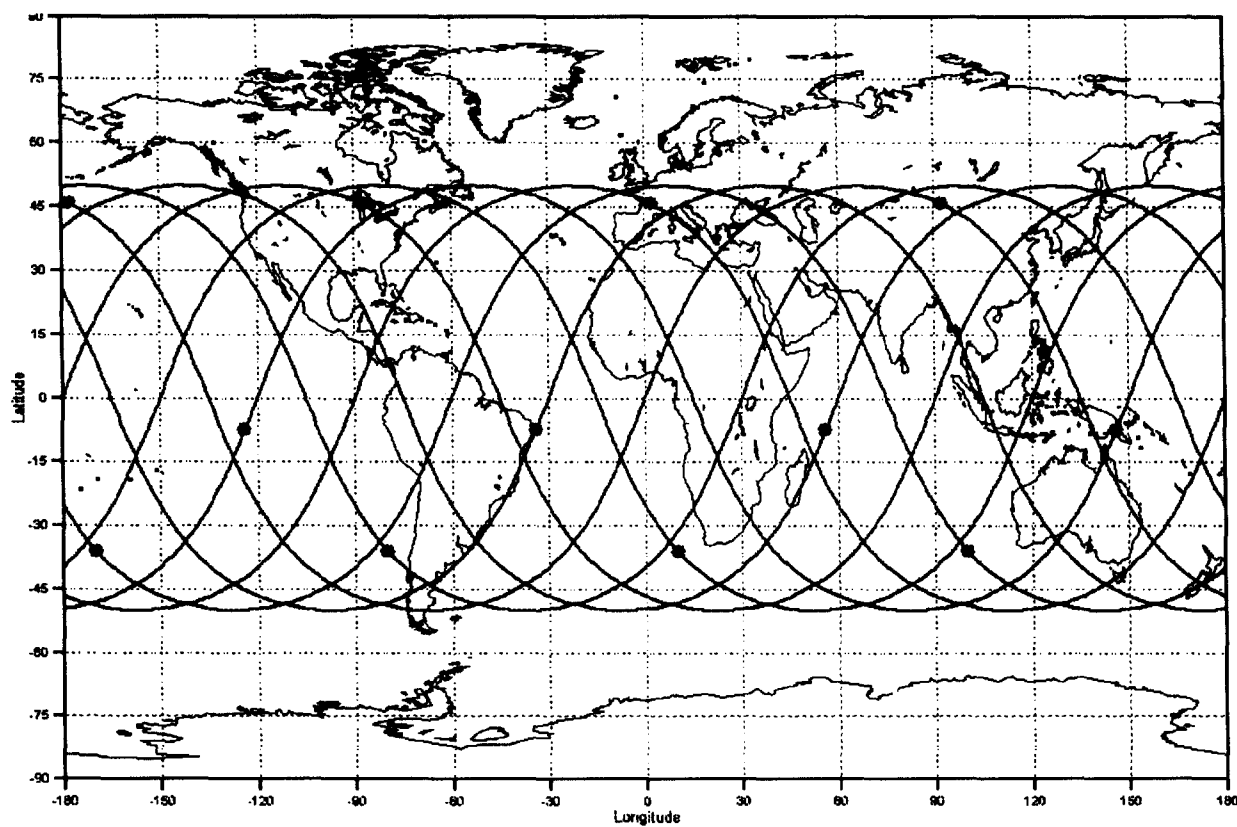


Figure 2. 12 Satellite Constellation Producing An Average Number Of Repeating Ground Tracks

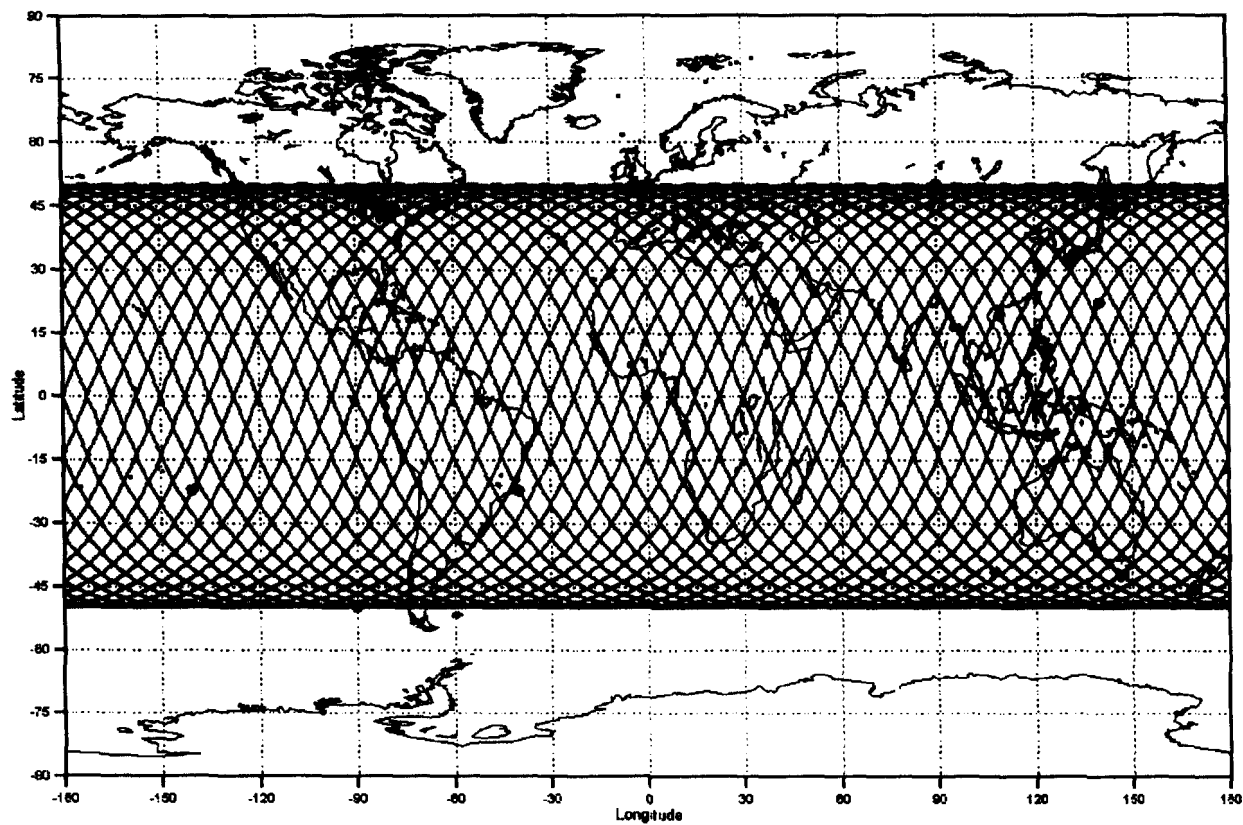


Figure 3. 12 Satellite Constellation Producing A Large Number Of Repeating Ground Tracks

CERTIFICATE OF SERVICE

I, Brent H. Weingardt, do hereby certify that a copy of the foregoing

Petition For Partial Reconsideration has been sent, via first class mail, postage prepaid, (or as otherwise indicated) on this 27th day of September, 1996 to the following:

- * Chairman Reed E. Hundt
Federal Communications Commission
Room 814
1919 M Street, N.W.
Washington, DC 20554

- * Commissioner James H. Quello
Federal Communications Commission
Room 802
1919 M Street, N.W.
Washington, DC 20554

- * Commissioner Rachelle B. Chong
Federal Communications Commission
Room 844
1919 M Street, N.W.
Washington, DC 20554

- * Commissioner Susan B. Ness
Federal Communications Commission
Room 832
1919 M Street, N.W.
Washington, DC 20554

* Via Hand Delivery